

New Horizons in Solar System Exploration

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Introduction and Current Programs

During the first decade of the 21st century, the Solar System Exploration program will emphasize the continuing search for knowledge about the origin and possible existence of life in the solar system and in the cosmos. An aggressive program of Mars exploration, including the return in 2008 of the first carefully selected Martian samples, will focus on Mars' biological history and will set the stage for more detailed robotic and human missions in the later decades. A program of missions to the outer solar system will study the chemical building blocks and pre-biotic chemical processes that lead to life. This program will begin with the launch of the Europa Orbiter in 2003, to be followed by the Pluto-Kuiper Express in 2004 and the Solar Probe in 2007. Studies of the inner planets and small bodies, primarily via the Discovery program, will continue to provide important scientific results which will further our understanding of the origin and evolution of the solar system, Earth, and life.

space technology

Given these plans and expected results during the first decade of the 21st century, the scientific objectives and mission types for the following several decades are examined in some detail. This includes identification of key technology drivers and implementation options. This must be done in light of the other priorities in the NASA Office of Space Science to ensure that the programs and objectives are compatible and lead to a well-integrated program that is scientifically rich and publicly engaging.

Future Mars Exploration

The Mars exploration program in 2010 and beyond will consist of two primary thrusts. The first is to complete the sequence of three sample return missions, with additional samples planned for return to Earth in 2011 and 2013. During this time, the robotic exploration program will also emphasize more aggressive exploration modes such as deep subsurface drilling or coring and airborne mobility for global geological and mineralogical studies. This will contribute important scientific data in support of the second thrust, which is preparing for human exploration. This gradual coupling of the robotic and human Mars exploration activities will demonstrate a permanent NASA commitment to Mars exploration and utilization.

Future Outer Solar System Exploration

The outer solar system exploration program will continue to study the sources and reservoirs of water and organic materials in the outer planets and small bodies and will

begin to analyze in detail the chemical processes that take place there. Missions such as a comet nucleus sample return, Europa lander, and Titan atmospheric or surface laboratory are technologically very challenging but are required if we are to achieve a complete picture of the development of life in the cosmos.

New Horizons

With the progress being made in the identification of solar systems around other stars, in the understanding of the development of life in our solar system, and in the development of highly capable and robust microspacecraft systems, we can begin planning a very long term series of missions that will eventually allow us to robotically explore other stellar systems. The types of capabilities required and the scientific issues that can be addressed form a set of challenges unlike any that mankind has previously faced. The vision of interstellar exploration may become the driving force for many of the space science and technology activities of the 21st century.